

over-manned, as it consists but of sixteen persons, including officers, *savants*, two engineers, and three stokers. It is possible that by this time Nordenskjöld may have broken out of the ice and be on his way home by the Suez Canal. The letters received from him, referred to last week, are, Mr. Oscar Dickson informs us, dated February 8.

LETTERS from Prejevalsky, dated from Zaisan, March 20, inform us that the deep snows which cover the steppes had detained him there much longer than he had calculated. He was, however, to leave on March 21, and expected to reach Khami at the end of May, by way of the River Urunga and the southern spurs of the Altai; unless prevented by excessive heat and want of water, he was to pursue his journey to the town of Shachjeou. Then he would attempt to ascend the two plateaux of Tibet; after ascending the second plateau he would have 1,000 versts of desert to make before reaching Lassa, from which he hopes to visit South-east Tibet.

A COMPLETE history of all North Polar Expeditions from the remotest ages down to the present day is about to be published by Cotta of Stuttgart. The title will be "Im ewigen Eis," the author is the popular writer, Herr Friedrich von Hellwald. Numerous illustrations, maps, and plans will enhance the value of the work, which will appear in thirty parts. The well-known explorer, Julius Payer, one of the commanders of the Austrian Polar Expedition in 1874, has accepted the dedication of the work.

FROM the *Colonies and India* we learn that a private telegram from Aden conveys intelligence of the arrival there on the 15th inst. of the British India Steam Navigation Company's steamer *Chinsura*, from Bombay, *en route* for Zanzibar, having on board four Indian elephants, the property of the King of the Belgians. These elephants will be employed for the purpose of ascertaining whether such animals can be made a means of transport in Africa.

THE Inter-Oceanic Canal Congress has been diligently carrying on its work in Paris for the last fortnight. It was divided into several sections, each to consider a special department of the subject. On Monday the Technical Section of the Congress met to hear reports from its two sub-committees, the second of which admitted the possibility of constructing a canal with locks by way of Nicaragua, while for a level canal it considered the course proposed by Lieutenants Wyse and Reclus to be the best, subject, however, to certain modifications. The first sub-committee presented estimates of the probable cost of the various routes.

OUR ASTRONOMICAL COLUMN

THE TOTAL SOLAR ECLIPSE OF MAY 22, 1724.—In the *Illustrated London News* of Saturday last are some quaint extracts from the newspapers of the time, relating to this eclipse, the last that was total in England. It may not be without interest to examine the general circumstances of this phenomenon, which we are now enabled to do with much precision, by taking advantage of the data furnished in Prof. Newcomb's recently published "Researches on the Motion of the Moon." The elements are as follow:—

G.M.T. of Conjunction in R.A., 1724, May 22, at 5h. 26m. 33s.

Right Ascension	59	32	12.8
Moon's hourly motion in R.A.		38	21.1
Sun's " " " " " " " " " " " "		2	30.4
Moon's declination	21	5	7.4 N.
Sun's " " " " " " " " " " " "	20	31	28.9 N.
Moon's hourly motion in declination		10	53.3 N.
Sun's " " " " " " " " " " " "		0	29.0 N.
Moon's horizontal parallax	60	44	5
Sun's " " " " " " " " " " " "			8.7
Moon's true semi-diameter		16	33.1
Sun's " " " " " " " " " " " "		15	47.4

The sidereal time at Greenwich mean noon on May 22 was 4h. 1m. 3'6s., and the equation of time at conjunction in R.A. was 3m. 49'1s. additive to mean time.

Hence it appears that the central eclipse began at 3h. 41'6m. in long. $151^{\circ} 39' \text{ W.}$, lat. $13^{\circ} 55' \text{ N.}$; it occurred with the sun on the meridian in long. $82^{\circ} 36' \text{ W.}$, lat. $54^{\circ} 30' \text{ N.}$, and ended in long. $11^{\circ} 57' \text{ E.}$, lat. $45^{\circ} 28' \text{ N.}$, or the sun set centrally eclipsed near Padua.

It was therefore late in the afternoon with the sun at small altitude that the eclipse was witnessed in these islands, and the following figures must very nearly define the course actually pursued by the moon's shadow :—

LONGITUDE.		N. Limit.		LATITUDE.		S. Limit.
		°		Central Line.		°
4° W.	...	52 37	...	51 29.9	...	50 24
2° W.	...	51 57	...	50 49.5	...	49 43
0°	...	51 15	...	50 7.6	...	49 1
2° E.	...	50 32	...	49 24.4	...	48 18

The popular interest excited in this eclipse we may infer was mainly due to the publication of a chart of its track by Halley, then Astronomer-Royal. A copy of this chart is preserved at the apartments of the Royal Astronomical Society; it is entitled "A Description of the Passage of the Shadow of the Moon over Europe, as it may be expected May 11, 1724, in the Evening, by Edm. Halley, Ast. Reg." It was "Engraved and Sold by John Senex at the Globe against St. Dunstan's Church in Fleetstreet, Price 1s." Halley concludes some foot notes as follows:—"At London we compute y^e Beginning at 5h. 40m. P.M., y^e Middle, when it will be nearly Total at 6.37, and y^e End 7.29. We wish our Astronomical Friends a clear Sky."

It will be borne in mind that the old style was still in use in this country in 1724, and the eclipse was thus dated May 11. Halley's predicted track is in very close accordance with that we have obtained above. His chart shows the central eclipse passing just south of Wexford, north of Bridgwater, over the Isle of Wight and south of Dieppe to near Venice; his northern limit of total phase passes just south of Dublin, over Leominster and Oxford, and Brentford near London, by Cambray and just north of Strasburg; the southern limit passes a little south of Kinsale, Padstow, Chartres, &c.

Dr. Stukeley observed the eclipse from Haradon Hill, near Amesbury, Wilts, and the account of it which he published in his *Itinerarium Curiosum* has been frequently transferred to our popular works. Assuming his position to have been in about $1^{\circ} 47'$ west of Greenwich, with a latitude of $51^{\circ} 11'$, we find by the above elements that totality would commence at 6h. 26m. os. local mean time, and continue 2m. 34s., the sun being at an altitude of 12° . The eclipse was central at or close to Ventnor, and was total there for 2m. 47s.; the newspaper of the time says, more than $1\frac{1}{2}$ minute. Observations were made by Delisle and others at the Observatory of Paris, and by Maraldi and Cassini, at the Trianon, Versailles, "en presence du Roy." The calculated duration of totality at Paris is 2m. 23s., the middle at 6h. 49m. 41s. apparent time; Gaudin observed the duration 2m. 22s., and the middle at 6h. 50m. 2s.; other observers made the duration twenty seconds longer, which is certainly an error; at the Trianon it was observed to be 2m. 16s., a little less than the calculation makes it. The original observations of the French astronomers are given at p. 129 of Prof. Newcomb's work.

The next total eclipse of the sun visible in England will take place early on the morning of June 29, 1927, but totality will only continue some ten seconds.

THE MIGRATION OF BIRDS

IN a reply of Dr. Weismann's to some remarks by Prof. A. Newton in his paper on the migration of birds (*NATURE*, vol. xix, p. 579), a statement of mine is

quoted to the effect that "in July young starlings pass over Heligoland by hundreds of thousands *without a single old bird* accompanying them," the learned Doctor adding that he "cannot regard this as a *fact*, but as a more or less probable *conjecture*." This is a rather bold and unceremonious assertion. As, however, Dr. Weismann, with reference to the above, and to the autumnal passage of young birds prior to their parents in general, puts the question "*but are these really facts?*" admitting that if they were they would "seem to be against the sufficiency of the five senses"—and as in any probable future efforts of the learned gentleman's on the above topic, incontestable *facts* might prove infinitely more useful than ever so voluminous an amount of nicest *conjecture*, I beg to be allowed to contribute some statements bearing on the question, which are based on daily observations of mine now extending over a period of more than forty years, and made on Heligoland—than which an observatory more favoured for such purposes the rest of Europe may not afford.

Personal experience the learned Doctor does not seem to command respecting the migratory movements of birds, otherwise it might be supposed that he would have brought forward the results of his observations either in refutation of mine, or in confirmation of the same, and I cannot help adding that in my humble opinion, the treatment in whatever form of so grand and mysterious a phenomenon as the migration of birds, should be preceded by a study of the same in nature, if only it were in its simplest outward appearances. Such a proceeding would prevent the continual repetition of certain traditional errors, and of the building thereon of fallacious inferences and hypothetical assumptions.

But to return to the starlings in question. The learned Doctor maintains that I "could not possibly have inspected a hundredth part of these 'hundreds of thousands' of starlings flying about." Now, to a Heligolander, such a view of the question would, if anything, be most amusing. I fully uphold what I stated: all these birds touching Heligoland *are* inspected, and I may add that such is done by the most competent judges, who, in fact, think very lightly of distinguishing a young starling passing overhead from an old one.

When, in my correspondence with Prof. Newton, I drew his attention to the fact of the autumnal movement of young birds taking place from one to two months prior to that of their parents, I purposely referred to a species affording the most easy means for observations corroborative of my views, viz., the common starling. This bird is one of the very few species which perform their migratory flights at so moderate an altitude as to permit of the most satisfactory scrutiny of each individual of a whole flock. Besides such a scrutiny is greatly facilitated by the different colour of the old and young birds at the season in question; the former, on the wing or on the ground, appearing at any distance perfectly black, whilst the latter are of a very light brownish-grey colour, verging underneath on a soiled white; the entire appearance of both differing to such an extent that if a flight of these birds were passing overhead at a height from fifty to three hundred feet, consisting of even a thousand individuals, it would require but the most cursory glance forthwith to detect a single old bird among the whole number. That such appears so very incredible to Dr. Weismann only proves how very little practice he can have had in these matters:

Moreover, a very great proportion of these young starlings alight for some hours on the upper plateau of the rock, and furnishing, in contradistinction to the old tough birds, a rather dainty dish, they are pursued by the Heligolanders very eagerly, and shot in great numbers; the island taxidermist, Aeukeus, for instance, succeeding last summer in bagging *eighty-three* such young birds at the discharge of his two barrels. This latter incident alone

may prove what quantities of these birds are captured here during the month of July of each succeeding year, and I repeat, they never contain the slightest admixture of old black specimens.

The above I suppose will be admitted as sufficiently *demonstrative facts*, and will I trust exculpate me from "building far-reaching theoretical inferences," a proceeding against which the learned doctor gravely says we must guard. May I be permitted to ask: to *whom* is this warning given? for hitherto I was rather given to believe that conjectures, theoretical inferences, and the like generally grow much more luxuriantly beneath the limited light of the study-lamp than in the face of free matter-of-fact nature.

Here may follow a few data respecting the periods of passage of the old and young starlings as noted down from daily observations, and I leave it to Dr. Weismann to admit the same as the documentary evidence of an "excellent ornithologist," as he so courteously terms me, or perhaps to dismiss them as of undemonstrated validity.

Sturnus vulgaris.—First week in June, 1878, some solitary old birds of extremely abraded plumage—supposed to be individuals that had lost their mates or were otherwise disturbed whilst breeding.

June 20 and 21, great flights of young birds; 22nd, 23rd, and 24th, enormous numbers of young birds; up to the end of the month thousands of young birds daily.

July 1 to 12, from a thousand to ten thousand young birds daily; 16th, many flights of hundreds; 25th, great many young birds.

Then follows a pause of two months during which no starlings whatever were seen, the migratory move being taken up again on September 22, when I find noted down:—

Starlings, old birds in fresh plumage, flights of many hundreds.

October 2 and 7, great many old birds; 8th, flights of thousands; 13th, Royston crows and old starlings by tens of thousands; 14th, crows many thousands, starlings hundreds of thousands; 15th, many; 16th, a few only; 20th, tens of thousands; 28th, great many.

November 18 and 19, flights from twenty to fifty.

December 9 to 18, flights from forty to sixty daily.

Thus I have witnessed the autumnal migration of the old and young starlings during the long series of years above stated. Invariably nothing but young grey birds pass over here (and in a broad front extending to both sides of the island) from the latter part of June to the end of July; then a pause ensues lasting from six weeks to two months, when during the latter part of September the movement is taken up again by the old birds in fresh black plumage, and continued to the close of November—by straggling parties oftentimes kept up till Christmas.

These are incontestable facts, however incredible they may appear to Dr. Weismann; but he may rest assured that not only all the young and old starlings passing over here *are* "inspected," but the many hundreds of thousands of miscellaneous birds visiting this island have to pass a very critical review in addition.

I cannot conclude these remarks respecting the question of young birds preceding during their first migratory trip their parents by one or two months, without stating that, so far as my long experience on Heligoland extends, there exists, among the 360 odd species collected here by myself, only one solitary exception to the general rule, viz., the cuckoo, *Cuculus canorus*, of which species the *old birds precede* their young by at least four weeks. Of all the rest, the young birds of the summer open the grand autumnal flight, *unaccompanied by any old*, the very finest old males at the close of the season bringing up the rear. In spring, however, *quite the reverse invariably takes place*, then the most perfect old males appear first, followed soon by old females, and later by younger birds of less perfect

appearance, in this instance the rear being brought up by the halt and lame: crippled birds that have lost a greater or less number of their wing or tail feathers, some toes, or even a whole foot.

All this is very strikingly exemplified here by the black-bird, for instance, with its varying dress according to age and sex, and this might with some attention be observed at other places also, though in the middle and south of England and Germany such observations become greatly more complicated, on account of the immigrants from the north mixing with such of the same species as have been breeding in these more southern latitudes, and where the grand opening migratory rush, as witnessed here in full original purity, has more or less relaxed in a *con amore* travelling by easy stages.

H. GÄTKE

Heligoland, May 7

THE U.S. NATIONAL ACADEMY

ONE of the chief scientific events of the year in the United States is the annual meeting of the National Academy of Sciences, the most select scientific body in America, election to which is regarded as stamping a man as an acknowledged leader in science. This year the meeting took place at Washington from April 15 to 18, the acting president being Prof. O. C. Marsh, who opened the proceedings with a review of the Academy's official work during the previous year. He had to record the great loss sustained by the Academy in the death of its president, Prof. Joseph Henry, on May 13 last year. Henry had been president of the Academy for ten years. One of the principal functions of the Academy during the past year was the consideration of a plan for the reorganisation of the U.S. Surveys, to which we have already referred at length.

At the meeting of the Academy in April last year a resolution was adopted authorising the appointment of a committee to consider a plan proposed by Prof. Newcomb for determining the distance of the sun by measuring the velocity of light. In accordance with this vote, Prof. Marsh appointed as members of the committee, President F. A. P. Barnard, Professors Wolcott Gibbs, Henry Morton, George F. Barker, and E. C. Pickering. Their report was so favourable to the plan proposed that Prof. Marsh sent it to the Secretary of the Navy for transmission to Congress. An appropriation of 5,000 dols. for the required purpose was thus secured, and the work of constructing the necessary apparatus will be commenced as soon as the appropriation is available. The expenditure of the funds is entrusted to the Secretary of the Navy. It is hoped by those who proposed this plan that the experiments will lead to a more accurate determination of the distance of the sun than can be obtained by any other method known to astronomy.

Prof. William B. Rogers was elected President of the Academy, to fill the vacancy caused by the death of Prof. Henry. The election is a deserved tribute to Prof. Rogers, who has for half a century held a prominent place among American men of science. He was for many years a leader among American geologists in adopting the modern theories of evolution, and defended his views with rare eloquence as well as strong argument. During his connection with the Massachusetts Institute of Technology (1862-68), the health of Prof. Rogers became so much impaired that he was obliged to withdraw from all studious pursuits for a long period. His recovery of health was the occasion of hearty congratulation in 1875, when he was for a second time elected President of the American Association for the Advancement of Science. The new president is loved by everybody, is venerable with silver locks, and still retains the silver-tongued eloquence for which he used to be famous. But he is by no means rugged, and has to take care not to over-exert himself.

Many valuable papers were read during the meeting of

the Academy, but our space will only permit of our referring to a few. We append a complete list, and those who desire a complete report of the Academy's proceedings will find it in *Science News* of May 1 and following numbers.

Two papers were presented by Mr. Peirce, entitled respectively, "On Ghosts in Diffraction Spectra" and "Comparison of Wave-Lengths with the Metre." It is well known to users of diffraction spectroscopes that ghosts of the lines appear in the images. Mr. Peirce has investigated this subject from a mathematical point of view, and he presented to the Academy a series of calculations based on the conditions which call forth these ghosts, and concluding with formulæ for determining their positions. In conjunction with Mr. Rutherford, Mr. Peirce has been investigating the relation of the wave-lengths of light to the metre. The object is to obtain a basis for measuring the standard metre. The metres that have been issued as standards change in length after a lapse of time. The German metre is said to differ from the French metre by one 25,000th. Mr. Peirce proceeded on the assumption that the wave-lengths of light are of a constant value. Certain questions have arisen in the course of this research. It was necessary to ascertain whether the spectral lines were fine enough to serve the purpose. There was a doubt as to whether the lines were displaced by "ghosts," and this led to the mathematical inquiry, previously alluded to, which has defined the position of ghosts relatively to the lines. Again, it was found needful that the spectrum to be observed should be at its maximum of brilliance. It had been noticed that two spectra composing a pair (that is, of the same order) are usually of different brightness, the right side spectrum differing from the left side one. This was specially true of spectra obtained from ruled glass; those from speculum metal were not so notably diverse in brightness. Examination showed that this characteristic was due to a difference in the sides of the groove ruled in glass. The diamond, in ploughing through the surface, raises a burr on the side of the furrow, and hence makes the two sides of the cut of unequal height. At first it was attempted to remove this imperfection by rubbing off the burr; but it was found that the material of the burr went to fill up the groove, and thus rendered the glass plate unserviceable. But, by first filling the groove with black-lead, then polishing off the burr, and finally removing the black-lead, plates were obtained that gave spectra of the utmost brilliancy, and the right and left spectra of each pair did not differ in brightness from each other. Mr. Peirce also gave the particulars of other improvements recently made in spectroscopic apparatus. One of these involved the construction of glass circles, and the work was so delicate that a well-known instrument maker had failed in four attempts. A method was described by which the accurate focussing of the heliostat—a matter of great importance—had been satisfactorily attained. The experimenters have succeeded in measuring a number of decimetre scales by centimetres. The probability of a single error is within the fiftieth part of a micron. (A micron is as much smaller than a millimetre as the latter is less than a metre.) Means have been devised which keep the apartment, where the experiments are made, at a fixed temperature, within one-tenth of a degree of Fahrenheit. With a sufficient number of observations, and the use of apparatus having their latest improvements, these experimenters hope to attain the object of their research, and limit the error to one-millionth part of a wave-length.

Prof. E. C. Pickering's paper on eclipses of Jupiter's satellites was one of considerable importance. He showed the value of the photometric method of observing these eclipses, and the valuable data that might be obtained by improvements in this method, both as to the sun's distance and as to Jupiter himself and his satellites.

In a paper on the winds on Mount Washington compared with the winds near the level of the sea, Prof. Elias Loomis came to the following conclusions:—1. In a majority of the cases where an area of low barometer passes over New England, attended by the usual circulating winds at the surface stations, this system of circulating winds does not extend to a height of 6,000 feet. 2. This system of circulating winds extends to the greatest height when the depression of the barometer is unusually great. 3. When, during the progress of an area of low pressure, a system of circulating winds reaches to the summit of Mount Washington, the change of wind to the east quarter usually begins at the surface stations eleven hours sooner than on the summit of the mountain; and the change back from east